RESEARCH HIGHLIGHT

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Patterns of Use of Different Toilet Grab Bar Configurations by Community-Living Older Adults

INTRODUCTION

Falls are common among older adults and can have serious consequences on their well-being. A high proportion of these falls occur as a result of unsuccessful transfers from one position to another. Within the scope of personal care activities, transferring to and from a toilet is usually viewed as a difficult task by elderly adults. Assistive devices can significantly reduce the risk of falls and decrease the difficulty of performing a task, and they are important tools in rehabilitation and assisted living. Bathroom assistive devices help to compensate for functional limitations, increasing independence and safety in bathroom activities. For the bathroom environment, assistive devices usually consist of raised toilet seats and grab bars. Although assistive devices have been identified as a high-priority basic safety feature by older adults and reported as one of the most frequently installed home safety modifications, their presence in the bathroom environment does not necessarily imply proper usage. Common reasons for not using them or using them improperly include placement that is inadequate, lack of training or lack of physical strength.

Standards and regulations usually dictate where grab bars should be located, typically based on the needs of the average user and the design constraints of the manufacturing industry. However, standardized placement may not be equally appropriate to address the wide range of functional needs and limitations in older adults.

PURPOSE OF THE STUDY

The purpose of the study was to evaluate the patterns of use, as well as the perceived usefulness and perceived safety of different toilet grab bar configurations for seniors. These different configurations were examined to identify barriers to their acceptance and use: 1) commode, a toilet frame mounted on the toilet with two horizontal bars; 2) two vertical bars; 3) one vertical bar; 4) one horizontal bar; 5) two swing-away bars; 6) a diagonal bar; and 7) no bar.

The specific objectives for this project were to: 1) determine if and how people actually use toilet grab bars; 2) determine which configuration was more effective in facilitating safe toilet transfers; 3) determine if the grab bar configuration used had an influence on loading of the lower extremities; and 4) identify barriers to the acceptance and use of toilet grab bars.

METHODOLOGY

A total of 47 people completed all phases of the study: 18 younger adults and 29 older adults including 7 participants after a stroke and 8 participants after a hip fracture. Younger adults were recruited through the student body of the University of Ottawa and older adults through various community agencies. Testing required approximately 30 minutes for younger adults and 60 minutes for older adults. Participants completed the Bath Grab Bar Effectiveness During Balance Perturbation questionnaire,

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which includes socio-demographic characteristics (age, gender, marital status, living arrangements, mother tongue, education and income) and indicators of health status, the Falls Behavioural (FaB) Scale for the Older Person, patterns of bathing, as well as patterns of utilization and acceptability of bathroom aids.

Once the questionnaires were completed, participants entered the artificial bathroom and stood with one foot on each mat directly in front of the toilet with their backs to the toilet. Following a prompt by the researcher, each participant performed five sitting (lowering oneself to the toilet seat) and five standing (raising oneself from the toilet seat) trials on the toilet for each of the six toilet grab bar configurations and an additional set of trials using no toilet grab bars (NB). For each configuration with two bars, participants were asked to use both bars if they could, although some hemi-paretic stroke patients could only use one arm. Furthermore, given the hemi-paresis of some of the stroke patients, some participants could not complete some of the unilateral bar configurations (depending on which side and to what extent they were affected). Immediately after the sitting and standing trials were completed for each configuration, participants were asked to rate the safety, ease of use, helpfulness, preference for installation and comfort of each configuration using a five-point Likert scale. Higher scores denoted favourable ratings. A composite rating score was then calculated by adding the five ratings together for a maximum positive rating of 25.

An artificial bathroom was designed for this study, consisting of two standard-height, 43-cm (17in.) public toilets. Placed directly in front of the toilets were two 25- by 100-cm (10- by 40-in.) pressure-sensitive floor mats, one for each foot, which were positioned beside each other so that they extended lengthwise away from the front of the toilet. These pressure-sensitive floor mats were connected to a computer via a USB cable, and data was collected digitally. In addition to the floor mats, six toilet grab bar configurations were built around the two toilets: a commode (C); two vertical toilet grab bars (2VB), one bolted to the floor and one fixed to the wall; one vertical bar (1VB); a horizontal toilet grab bar (H) fixed to the left side wall; two swing-away toilet grab bars (S) fixed to the rear wall; and a diagonal toilet grab bar (D) fixed to the right wall. These were used to aid in sitting down and standing up from the toilet. The C, 2VB, 1VB and H configurations were built around the first toilet, and the S and D toilet grab bars were built around the second toilet. Each toilet grab bar configuration was instrumented with pressure sensors which were built into polyethylene foam and wrapped around the toilet grab bars. The seat of the commode was raised to 50 cm (20 in.) high, so that it just cleared the toilet seat, but all other configurations used the standard 43-cm (17-in.) high toilet seat.

RESULTS

The healthy adult group required the diagonal bar for the least amount of time during transfers (implying a faster transfer). Pressure was applied for a longer duration to the two vertical bars in this population group. When using the diagonal bar, where significant differences were found, healthy older adults demonstrated a reduced medial-lateral (M-L) centre-of-pressure (COP) deviation, when compared to all other bar configurations. Healthy older adults demonstrated a greater anterior-posterior (A-P) COP deviation than healthy young adults. Thus, A-P COP deviation can be a description of the changes in balance (while transferring) that occur with age. Since it is also known that, as people age, balance ability can decrease, a desired A-P COP deviation is closer to the deviation displayed by the young adult group—that is, a smaller A-P COP deviation. When using the horizontal bar, however, healthy older adults demonstrated a greater A-P COP deviation than when using any other configuration.

Healthy older adults demonstrated preferences for the diagonal bar or the two vertical bar configuration in the Likert rating results. The results also show that the diagonal bar is an effective toilet grab bar for this population group based on ratings and transfer time. In addition, when the diagonal bar is used, noticeable differences in M-L COP deviation are demonstrated. Undesirable A-P COP deviation is noted when using the horizontal bar.

The older adults who had had a stroke preferred the two vertical bar configuration and the diagonal configuration, as well. While the differences in the duration of pressure applied to each bar were not significant, this group applied pressure to the bars for longer periods than other groups for each of the corresponding bar configurations. No significant differences were found in M-L COP deviation; however, when using the two vertical bars, the A-P COP deviation was significantly smaller on both the paretic and non-paretic sides than with the other configurations, in particular the horizontal and no-bar configurations. Older adults after a stroke can benefit from two vertical bars as an assistive toileting aid.

Older adults who had had a hip replacement demonstrated a preference for several bar configurations including the two vertical bars, the single vertical bar, the swing-away bars and the commode. When moving from a sitting to a standing position, pressure was applied longest to the two vertical bars. No significant differences were found in the M-L COP deviation, and the AP COP deviation was quite variable when using different bar configurations. Our data suggest that the best assistive device for an individual in this population group is likely to be based on personal preference.

While different population groups preferred different toilet grab bars, all groups involved in this study least preferred the horizontal bar, which is currently the CSA-recommended bar. When asked to consider helpfulness, ease of use, safety, comfort and likeliness of installation, the horizontal grab bar fared poorly. In fact, in all participant groups, not using an assistive device was rated more highly by study participants than using a horizontal bar. A possible barrier to the use of toilet grab bars may be that, once individuals try out the recommended grab bar and find it performs poorly, they may not be inclined to look any further for an assistive device.

IMPLICATIONS FOR THE HOUSING INDUSTRY

- Different population groups require different assistive aids to create a safe toileting environment because of strength capabilities and different physical limitations.
- Grab bar standards could be improved by considering the anthropometry of elderly individuals when suggesting installation dimensions.

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